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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of: Kim

Serial No. 09/287,602

Filed: April 7, 1999

For: GAS SCRUBBER FOR TREATING THE GAS GENERATED DURING THE SEMICONDUCTOR MANUFACTURING PROCESS

Group Art Unit: 1764
Examiner: Tran, H.

Atty. Dkt. No. 5480-00201

I hereby certify that this correspondence is being deposited with the U.S. Postal Service with sufficient postage as First Class Mail in an envelope addressed to: Commissioner for Patents, Washington, D.C. 20231, on the date indicated below:

February 21, 2003
Date

Kevin L. Daffer

APPEAL BRIEF

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Sir/Madam:

Further to the Notice of Appeal faxed January 15, 2003 and received in the U.S. Patent and Trademark Office on January 15, 2003, Appellant presents this Appeal Brief. The Notice of Appeal was filed following mailing of an Advisory Action on December 20, 2002. Appellant hereby appeals to the Board of Patent Appeals and Interferences from a final rejection of claims 1-21 in the Advisory Action mailed December 20, 2002, and respectfully requests that this appeal be considered by the Board.

I. REAL PARTY IN INTEREST

The subject application is owned by KOREA M.A.T. Co., Ltd., a corporation having its principal place of business at 312-3 Daehong-Ri, Sunghwan-Up, Chunan, Chung-Nam, 330-800, Korea, as evidenced by the assignment recorded at Reel 9924, Frame 0477.

II. RELATED APPEALS AND INTERFERENCES

No other appeals or interferences are known which would directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

Claims 1-21 were originally filed in the present application. Claims 1-19 and 21 were amended in a response filed January 4, 2001 to an Office Action mailed October 4, 2000. Claim 7 was amended in a response filed June 22, 2001 to an Office Action mailed March 22, 2001. Claims 1, 6, 7 and 15 were amended in a response filed November 20, 2001 to a Final Office Action mailed September 13, 2001. In response to an Advisory Action mailed January 29, 2002, a Continued Prosecution Application was filed March 13, 2002. Claims 1, 4, 6, 7, 12, 13, 16 and 21 were amended in a response filed August 13, 2002 to an Office Action mailed May 17, 2002. No amendments to the claims were made in a response filed December 3, 2002 to a Final Office Action mailed October 17, 2002. Claim 6 stands finally rejected under 35 U.S.C. § 112, second paragraph and claims 1-21 stand finally rejected under 35 U.S.C. § 103, which are the subject of this appeal. A copy of claims 1-21 on appeal (incorporating entered amendments) is included in the Appendix hereto.

IV. STATUS OF AMENDMENTS

No amendments to the claims have been filed subsequent to their final rejection. The Appendix hereto therefore reflects the current state of the claims.

V. SUMMARY OF THE INVENTION

Appellant's claimed invention relates to a gas scrubber for disposing harmful gases used in or generated by a semiconductor manufacturing process. More particularly, the invention relates to a gas scrubber (1, Fig. 1) that includes a combustion chamber (10) for burning explosive and flammable elements of a waste gas, and a wetting chamber (30) placed below the combustion chamber for dissolving water-soluble elements of the waste gas. After treating the waste gas in the combustion and wetting chambers to eliminate any noxious and harmful elements, the treated gas is released to the atmosphere through an exhaust pipe (50) extending from the wetting chamber. (Amended Specification -- page 6, lines 9-17).

According to one embodiment, the combustion chamber includes a case (13) connected to at least two gas intakes (11, 11') and one or more air intakes (Fig. 3, 12). The case has a heating means to apply heat to the waste gas that enters via the gas intakes. In some embodiments, the heating means may include a heating chamber (Fig. 1, 14) and a plurality of heat exchange units (15). In some embodiments, the heat exchange units may be placed in double lines from the upper part to the lower part of the heating chamber in order to supply heat evenly to the exhaust gas. In an additional embodiment, the heat exchange units each comprise a ceramic heater (Fig. 5, 15a) for generating heat with electricity and an insulator (15b), or heat retention material, which is placed between the ceramic heater and the outer surface of the heat exchange unit. The ceramic heaters function to raise the temperature of the outer surface of the heat exchange units to a temperature high enough (e.g., 800° C) to burn the flammable and explosive elements of the waste gas as it passes through the heat exchange units. The ambient temperature within the heating chamber may be adjusted by adding or reducing heat to the heat exchange units, or alternatively, by adding or reducing the number of heat exchange units within the heating chamber. (Amended Specification -- page 6, line 19 to page 7, line 2 and page 9, lines 26-30).

In some embodiments, an air intake (12) is attached to the upper part of the heating chamber for spraying air at fixed time periods to remove any powder, which may form on a surface of the heat exchange units during the burning process. (Amended Specification -- page 9,

line 30 to page 10, line 3). In an additional embodiment, cleaning air nozzles (17) may be placed at both sides of the upper part of the heating chamber to blow off any powder that may have formed. Similar to the air intake, the cleaning air nozzles are configured to automatically remove the powder by supplying air at predetermined time periods. (Amended Specification -- page 7, lines 15-20).

In some embodiments, the wetting chamber comprises a case (Fig. 1, 31) including a central part having a plurality of partitions (31a), which form a passage for the gas to enter from the combustion chamber, and a lower part containing water. In some embodiments, a plurality of absorbers (32) installed between the plurality of partitions and the case form a passage for the waste gas to flow through the wetting chamber in an up and down direction. In some embodiments, a shower nozzle (33) installed above each of the plurality of absorbers sprays water continuously to dissolve the harmful, though water-soluble elements of the waste gas. At the same time, the gas is cooled due to the cooling effect of water. (Amended Specification -- page 8, lines 4-15 and page 10, lines 13-18).

In some embodiments, the gas scrubber may also include a means for preventing or removing a powder or particulate matter, which may form at the interface of the combustion and wetting chambers. In some embodiments, such means may include a guide plate (Fig. 1, 61) attached to plate materials (61a) for forming a square funnel-shaped guide. As such, the guide plate may function to guide the waste gas from the combustion chamber to the wetting chamber. In some embodiments, an injection nozzle (Fig. 3, 62) installed on all four sides of the guide plate may inject air or nitrogen across the guide plate to prevent or remove powder formation at the interface between the combustion and wetting chambers. (Amended Specification -- page 9, lines 1-7).

VI. ISSUES

1. Whether claim 6 is unpatentable under 35 U.S.C. § 112, second paragraph, as being indefinite.

2. Whether claims 1-21 are unpatentable under 35 U.S.C. § 103(a) over U.S. Patent No. 5,900,217 to Hartung et al. (hereinafter "Hartung") in view of Korean Patent Publication 97-9311 to Kim (hereinafter "Kim").

VII. GROUPING OF CLAIMS

Claims 1-5, 7, 8 and 14-21 (Group I) stand or fall together.
Claim 6 (Group II) stands or falls alone.
Claims 9-13 (Group III) stand or fall together.

The reasons why the three groups of claims are believed to be separately patentable are explained below in the appropriate parts of the Argument.

VIII. ARGUMENT

Gases having harmful, flammable and corrosive properties are often used when manufacturing a semiconductor product. To prevent or minimize environmental contamination or pollution through leakage of gas materials into the atmosphere, regulations and laws are strictly enforced to purify the gas before it may be released into the atmosphere. As such, gas scrubbers are typically used to eliminate the flammable, explosive and toxic elements of gases used by or produced during a semiconductor manufacturing process. Conventional methods for treating the waste gases typically include a burning method for burning flammable or explosive elements of the gas and/or a wetting method for dissolving toxic elements of the gas. Unfortunately, several problems exist with these methods of gas treatment. For example, conventional wetting method gas scrubbers are unable to treat flammable or insoluble elements

within the gas, whereas conventional burning method gas scrubbers are inadequate for treating toxic gases that are not flammable. *See* Amended Specification: page 1, line 14 to page 2, line 3.

Though combination gas scrubbers have been developed to utilize both burning and wetting methods, they too suffer from many disadvantages. In particular, conventional combination gas scrubbers require frequent maintenance due to the formation of a powder in the area where the gas flowing from a combustion chamber makes contact with water or a cooler gas from a wetting chamber. The powder is generally a particulate that forms whenever the relatively hot gas from the combustion chamber contacts a relatively cool gas or a surface cooled by the water in a wetting chamber. Whenever a conventional combination gas scrubber needs repair, the main manufacturing system that produces the waste gas must be put on hold, thus, reducing the productivity and throughput of the overall manufacturing system. Therefore, it would be beneficial to provide a combination gas scrubber, which can effectively dispose of harmful waste gases used by or generated during semiconductor manufacturing processes. Such a combination gas scrubber would substantially eliminate system idle time by providing a means for automatically preventing or removing a powder or particulate matter, which may form due to a temperature difference between two gases. *See* Amended Specification: page 2, lines 13-19.

The invention as recited in claims 1-21 addresses the above-described problems by providing a combination gas scrubber having a combustion chamber for eliminating flammable and explosive elements of a waste gas and a lower wetting chamber for eliminating water soluble elements of the gas, which were not burned in the combustion chamber. In addition, the combination gas scrubber includes a means for preventing or eliminating a powder or particulate, which may form due to a significant temperature difference between two gases. Such means may function by reducing the production of powder and/or by sweeping any powder formation away. The inclusion of such means, therefore, increases the efficiency rate of the gas scrubbing system by automatically preventing or removing powder without system interruption. *See* Amended Specification: page 4, lines 18-28 and page 11, lines 20-23.

In an embodiment, the combustion chamber of the gas scrubber includes a case, which is connected to at least two gas intakes for receiving a waste gas and to one or more air intakes. The case includes a heating chamber having a plurality of heat exchange units, which are arranged for applying heat evenly to the waste gas that enters via the gas intakes. During operation, the flammable and explosive elements of the waste gas are burned by passing though the heat exchange units. *See* Amended Specification: page 6, lines 19-27.

In some cases, a powder may form on an outer surface of the heat exchange units during the burning process. Therefore, an air intake is attached to an upper part of the heating chamber for spraying air at fixed time periods; thereby preventing or removing any powder that may form on the heat exchange units. The powder removed from the heat exchange units may then drop to the bottom of the case. Alternatively, or in addition to, a pair of cleaning air nozzles may be placed at both sides of the upper heating chamber to blow off any powder that may have formed on the heat exchange units. Similar to the air intake, the cleaning air nozzles are configured for automatic powder removal by supplying air at predetermined time periods. In this manner, the efficiency rate of the gas scrubbing system is increased by automatically preventing or removing powder from the heat exchange units without system interruption. *See* Amended Specification: page 7, lines 15-20; page 9, line 30 to page 10, line 3.

After the flammable and explosive elements of the waste gas are removed in the combustion chamber, the gas flows downward into the wetting chamber and through a passage formed by a plurality of partitions within a case of the wetting chamber. Inside the wetting chamber, the waste gas flows up and down along the passage through a plurality of water-drenched absorbers to dissolve the harmful, though water-soluble elements of the waste gas. By guiding the waste gas along the up and down passage, however, the path by which the gas takes becomes longer and the effectiveness of the absorbing process is increased. At the same time, the gas is cooled due to the cooling effect of water. *See* Amended Specification: page 10, lines 13-24.

In some cases, a powder or particulate matter may form at the interface between the combustion and wetting chambers due to a significant temperature difference between the two chambers. For example, the powder may be formed when a relatively hot gas of the combustion chamber contacts a relatively cooler gas or a cooler surface of the wetting chamber. *See* Amended Specification: page 3, lines 24-28. In this manner, a means for preventing or removing the powder or particulate matter at the interface of the combustion and wetting chambers may also be included within the gas scrubber. Such means may include, for example, a guide plate attached to plate materials for forming a square funnel-shaped guide. Such a guide plate may be arranged at the interface of the combustion and wetting chambers for guiding the waste gas from the combustion chamber to the wetting chamber. *See* Amended Specification: page 9, lines 1-5.

In some embodiments, an injection nozzle installed on all four sides of the guide plate may inject air or nitrogen across the guide plate to prevent powder formation at the interface between the combustion and wetting chambers. According to one embodiment, the injection nozzle may supply air or nitrogen continuously to the plate material of the guide plate for preventing contact between the high temperature gas of the combustion chamber and the low temperature gas of the wetting chamber. In other words, the air or nitrogen from the injection nozzle may form a gaseous curtain between the hot and cold gases, such that contact between the hot and cold gases is substantially prevented. In other embodiments, the injection nozzle may inject air or nitrogen across the guide plate to remove any powder that may have formed at the interface between the two chambers. In one example, the powder may be removed laterally into the space proximate to the guide plate. In another example, however, the powder may be removed through the opening of the four-sided guide plate and forced downwards into the wetting chamber. In either embodiment, the efficiency rate of the gas scrubbing system is increased by automatically preventing or removing powder formation at the interface between the two chambers without system interruption. *See* Amended Specification: page 9, lines 5-14.

ISSUE 1 ARGUMENTS

A. Patentability of Group II Claim 6

1. Claim 6 is definite because the claim particularly points out and distinctly claims the subject matter which applicant regard as the invention.

Claim 6 recites, "[t]he gas scrubber according to claim 5, wherein the combustion chamber comprises a relatively high temperature gas, wherein the wetting chamber comprises a relatively low temperature gas, and wherein the injection nozzle is adapted to prevent the high temperature gas from coming in contact with a substantial portion of the low temperature gas." In regards to claim 6, the Advisory Action states, "it is still unclear as to what structural limitation applicant is attempting to recite" (Advisory Action -- page 2). In particular, the Advisory Action states, "all of the structural elements have been recited in claim 1, e.g., a combustion chamber, a wetting chamber, an injection nozzle, and a guide plate... [a]ll that recitation in claim 6 is preventing the gas in the combustion chamber from coming in contact with the gas in the wetting chamber." (Advisory Action -- page 2).

The Applicant asserts, however, that claim 6 is used to impart an additional functional limitation upon the injection nozzle introduced in claim 1. A functional limitation is an attempt to define something (e.g., an injection nozzle) by what it does, rather than by what it is. There is nothing inherently wrong with defining some part of an invention in functional terms. Functional language does not, in and of itself, render a claim improper. *In re Swinehart*, 439 F.2d 210, 169 USPQ 226 (CCPA 1971). A functional limitation must be evaluated and considered, just like any other limitation of the claim, for what it fairly conveys to a person of ordinary skill in the pertinent art. MPEP 2173.05(g).

As such, one or ordinary skill in the art would recognize claim 6 as further limiting the functionality of the injection nozzle introduced in claim 1. For example, claim 1 places a functional limitation on the injection nozzle "to deliver a conditioned gas to a space proximate to the guide plate for minimizing the production and/or accumulation of a powder at an interface

between the combustion chamber and the wetting chamber." Claim 6 further limits the functionality of the injection nozzle by describing how the injection nozzle functions to minimize the production and/or accumulation of the powder. For example, claim 6 places an additional functional limitation on the injection nozzle "to prevent the high temperature gas from coming in contact with a substantial portion of the low temperature gas". As such, the limitations of claim 6 particularly point out and distinctly claim the subject matter which applicant regards as the invention and, therefore, are definite.

Conclusion

As explained in the above Argument, the limitation of claim 6 is a functional limitation, and therefore, is definite. The rejection of Group II claim 6 under 35 U.S.C. §112, second paragraph, is therefore asserted to be erroneous.

ISSUE 2 ARGUMENTS

A. Patentability of Group I Claims 1-5, 7, 8 and 14-21

1. None of the cited art teaches or suggests a gas scrubber including an injection nozzle adapted to deliver a conditioned gas for minimizing the production and/or accumulation of a powder at an interface between a combustion chamber and a wetting chamber.

Claim 1 recites, in part, "[a] gas scrubber comprising:... a guide plate arranged between the combustion chamber and the wetting chamber... and an injection nozzle having an opening adapted to deliver a conditioned gas to a space proximate to the guide plate for minimizing the production and/or accumulation of a powder at an interface between the combustion chamber and the wetting chamber." As will be described in more detail below, neither Hartung nor Kim teach or suggest the aforementioned limitation of present claim 1.

Hartung discloses an apparatus for purifying waste gases (Hartung -- Title). Hartung, however, does not teach or suggest a gas scrubber including an injection nozzle adapted to deliver a conditioned gas for minimizing the production and/or accumulation of a powder at an interface between a combustion chamber and a wetting chamber. In one example, Hartung discloses "a spraying nozzle [18] for the absorbent and scrubbing agent is disposed within the outer pipe and above the burner... for flushing the waste gases emerging from the combustion chamber and... at the same time cools the housing of the burner" (Hartung -- column 2, lines 21-26). In this manner, Hartung specifically describes spray nozzle 18 as adapted to deliver an absorbent or scrubbing agent, which is otherwise referred to as a "flushing liquid" (Hartung -- column 2, lines 27-30). In another example, Hartung discloses "a nozzle ring 19, with which water or an absorbent can be sprayed onto the inside of the inner pipe 16 during pauses in the operation, so that ... deposits there can be removed or reduced" (Hartung -- column 5, lines 12-15). In fact, the Office Action admittedly states, "Hartung et al disclose[s] an injection nozzle 19 for deliver[ing] water or absorbent" (Final Office Action -- page 9) – not a conditioned gas. Consequently, Hartung does not teach or suggest an injection nozzle adapted to deliver a conditioned gas, as recited in present claim 1.

Kim discloses a gas scrubber for treating toxic and flammable gas (Kim -- Title). Kim, however, does not teach or suggest a gas scrubber including an injection nozzle adapted to deliver a conditioned gas for minimizing the production and/or accumulation of a powder at an interface between a combustion chamber and a wetting chamber. As such, Kim cannot be combined with Hartung to overcome the deficiencies therein.

For example, Kim discloses that conventional gas scrubbers often require "frequent maintenance ... due to a formation of a powder in the area where the gas flowing out from the gas chamber makes contact with water..." (Kim -- page 2, lines 14-15). Kim also discloses that the disadvantage of conventional gas scrubbers is "[w]henever the gas scrubber needs to be repaired, the main manufacturing system that produces the exhaust gas is put on hold thus effecting the productivity." (Kim -- page 2, lines 16-17). As an improvement over conventional gas scrubbers, however, the invention of Kim includes a gas scrubber in which "wet chamber 40

is constructed with a main component comprised of the outer wall 46 and a detachable component having the partitions 42, 43, 44, 45. These components are assembled together with a flange coupled with a bolt 32, thus cleaning or repairing the device could be performed conveniently." (Kim -- page 8, lines 4-8). In this manner, Kim's solution to the problem of powder formation is to construct a gas scrubber, which may be conveniently disassembled for cleaning or repairing purposes. Therefore, Kim does not teach or suggest a gas scrubber including an injection nozzle adapted to deliver a conditioned gas for minimizing the production and/or accumulation of a powder at an interface between a combustion chamber and a wetting chamber, as taught in present claim 1.

In addition, the Examiner appears to agree with the Applicant's contention that Kim fails to teach or suggest the aforementioned claim limitation. For example, the Examiner states in the Advisory Action mailed December 20, 2002 that the Applicant's "contention is not persuasive as the primary reference, Hartung et al, is relied upon for such teaching." Similar statements were made in the Office Action mailed May 17, 2002 and the Final Office Action mailed October 17, 2002. By not addressing the Applicant's contention over Kim, the Examiner implies agreement with the Applicant that Kim does not (and cannot) teach or suggest the aforementioned limitation of claim 1.

2. None of the cited art provides motivation for a gas scrubber including an injection nozzle adapted to deliver a conditioned gas for minimizing the production and/or accumulation of a powder at an interface between a combustion chamber and a wetting chamber.

With regards to Hartung, the Advisory Action states, "[a]lthough ... nozzle 19 delivers water or absorbent, such nozzle is capable of delivering other fluids, such as gas, provided that it is used for minimizing the accumulation of a powder/deposits thereof." (Advisory Action -- page 2). The Applicant respectfully disagrees. In particular, and as will be described in more detail below, Hartung and Kim cannot be modified to teach or suggest an injection nozzle capable of delivering a gas.

Modifying spray nozzle 18 of Hartung to deliver a conditioned gas, for example, would render the invention of Hartung unsatisfactory for its intended purpose. If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). In particular, the invention of Hartung includes "spray nozzle 18 for supplying an absorbent ... for washing out the gaseous or solid reaction products formed during the combustion of the waste gas" (Hartung -- column 4, lines 64-67). As a result, the water-soluble elements contained in the waste gas are removed. However, if the invention of Hartung were modified such that spray nozzle 18 supplied a conditioned gas – instead of a liquid absorbent – spray nozzle 18 would no longer function to remove the reaction products (i.e., the water-soluble elements) formed during the combustion process. Therefore, Hartung provides no motivation to modify spray nozzle 18 to deliver a conditioned gas, as recited in present claim 1.

In addition, Hartung and Kim cannot be modified to teach or suggest an injection nozzle adapted to deliver a conditioned gas, since Hartung and Kim each fail to suggest the desirability of doing so. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990); MPEP 2143.01.

In particular, nozzle ring 19 of Hartung cannot be modified to deliver a conditioned gas – instead of water or an absorbent – since Hartung fails to suggest the desirability of making such a modification. Similarly, Kim fails to mention the manner in which the device can be cleaned, i.e., how the powder can be removed from the area where the gas flowing from the gas chamber makes contact with water. Therefore, Kim also fails to suggest the desirability for including an injection nozzle adapted to deliver a conditioned gas for minimizing the production and/or accumulation of a powder at an interface between a combustion chamber and a wetting chamber. Consequently, neither Hartung nor Kim can be modified, and therefore, provide no motivation to teach or suggest the aforementioned limitation, as recited in present claim 1.

Since none of the cited art provides motivation to teach or suggest the aforementioned limitation, the cited art cannot be combined to teach or suggest such a limitation. Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed.Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992); MPEP 2143.01.

Statements in the Advisory Action, however, imply that Hartung inherently teaches the injection nozzle of the presently claimed case. For example, and as noted above, the Advisory Action states, "[a]lthough ... nozzle 19 delivers water or absorbent, such nozzle is capable of delivering other fluids, such as gas, provided that it is used for minimizing the accumulation of a powder/deposits thereof. It should also [be] noted that the device by itself does not know what type of fluids, gas or liquid, is intended to be used therein." (Advisory Action -- page 2). By suggesting the possibility that nozzle ring 19 may be capable of delivering a gas, the Examiner suggests Hartung may inherently teach the claimed injection nozzle. As will be described in more detail below, inherency may not be established by probabilities or possibilities. Therefore, the Applicant respectfully disagrees with the Examiner's contention of inherency with regards to Hartung.

In particular, the extrinsic evidence of Hartung does not make clear that nozzle ring 19 may be used for delivering a conditioned gas, as opposed to water or a liquid absorbent; thus, the invention of Hartung does not inherently teach upon the claimed injection nozzle. "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'" *In re Robertson*, 169 F.3d 743, 745 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999); MPEP 2112. As will be described in more detail below, one of ordinary skill in the art would recognize that nozzle ring 19 of Hartung is not necessarily adapted to deliver a conditioned gas.

For example, Hartung describes nozzle ring 19 as configured for "cleaning the inside of the inner pipe 16 ..." (Hartung -- column 5, line 11). In addition, and as noted above, Hartung describes nozzle ring 19 as functioning to spray "water or an absorbent... onto the inside of the inner pipe 16 during pauses in the operation, so that... deposits there can be removed or reduced" (Hartung -- column 5, lines 12-15). Furthermore, nowhere within Hartung is it ever mentioned that nozzle ring 19 could be used to deliver a gas within inner pipe 16, or that a gas could be used to remove or reduce the deposits formed within inner pipe 16. Although nozzle ring 19 is capable of delivering a liquid in the manner disclosed by Hartung, nozzle ring 19 is not necessarily capable of delivering a conditioned gas for minimizing the production and/or accumulation of a powder at an interface between a combustion chamber and a wetting chamber. For example, one of ordinary skill in the art would recognize that a nozzle ring designed to deliver a liquid for a specific purpose may have substantially different design characteristics or configurations than a nozzle designed to deliver a conditioned gas for another specific purpose. Therefore, one of ordinary skill in the art would recognize that nozzle ring 19 of Hartung cannot necessarily deliver a conditioned gas, as presently claimed. Consequently, Hartung does not inherently teach or suggest the claimed injection nozzle.

3. The Examiner has failed to adequately support and/or establish a *prima facie* ground of obviousness.

To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all claim limitations. MPEP § 2143. None of these three criteria have been met by the Examiner in the present case. First of all, no suggestion or motivation to modify the cited references can be found within the cited references to teach or suggest the aforementioned limitation of claim 1, as explained above in Argument 2. The criterion of a reasonable expectation of success cannot be met if no teaching, suggestion or motivation exists, because there is then nothing at which to be successful. Finally, none of the cited art, either alone or in combination, teaches all of the

limitations of claim 1, as explained above in Argument 1. The third criterion recited above has therefore also not been met, and a *prima facie* case of obviousness has not been established.

Conclusion

As explained in Arguments 1-3 above, at least some limitations of present claim 1 are not taught or suggested by the cited art. Since claim 7 recites a similar limitation, at least some of the limitations of claim 7 are also not taught or suggested by the cited art. Furthermore, there is no teaching, suggestion or motivation to modify the cited art to teach the limitations of these claims. Therefore, claims 1 and 7 are patentably distinct over the cited art. Since claims 2-5, 8 and 14-21 are dependent on claims 1 and 7, claims 2-5, 8 and 14-21 are patentably distinct over the cited art for at least the same reasons as claims 1 and 7. The rejection of Group I claims 1-5, 7, 8 and 14-21 under 35 U.S.C. §103(a) is therefore asserted to be erroneous.

B. Patentability of Group III Claims 9-13

Because claims 9-13 are dependent from claim 7 of Group I, the arguments presented above for patentability of claim 7 apply equally to claims 9-13, and are herein incorporated by reference. Claim 9 further recites that the claimed combustion chamber includes a means for minimizing accumulation of a powder upon multiple heat exchange units of the combustion chamber. This additional recitation makes claim 9, and the dependents thereon, separately patentable over the cited art, as described in more detail below.

1. None of the cited art provides motivation to teach or suggest a gas scrubber including a pair of cleaning air nozzles installed on an upper side of a heater chamber for periodically delivering air across heat exchange units to minimize accumulation of powder upon an outer surface of heat exchange units.

In particular, claim 9 recites, "[t]he gas scrubber according to claim 8, wherein said heating means includes: a heating chamber; multiple heat exchange units arranged in a pattern of rows inside said heating chamber, wherein each of said heat exchange units comprise an

electrical heating element configured inside a ceramic casing; and a pair of cleaning air nozzles installed on an upper side of said heater chamber for periodically delivering air across the heat exchange units to minimize accumulation of powder upon an outer surface of the ceramic casings." In the Final Office Action mailed October 17, 2002, the Examiner states, "Hartung et al discloses a pair of cleaning nozzles (19) installed on both upper sides of the heater chamber." (Final Office Action -- page 7). As will be described in more detail below, such statements are hereby respectfully traversed.

As set forth in the Arguments concerning the patentability of claims 1 and 7, nozzle ring 19 of Hartung is adapted to deliver "water or an absorbent" – not a conditioned gas – and cannot be modified to deliver a gas. In the same manner, Hartung cannot teach or suggest a pair of cleaning air nozzles installed on an upper side of a heater chamber for periodically delivering air across heat exchange units to minimize accumulation of powder upon an outer surface of the heat exchange units, as recited in present claim 9. In particular, Hartung does not appear to suggest a desirability for modifying the gas scrubber of Hartung to include a pair of cleaning air nozzles as presently claimed. Similarly, Kim does not even mention the possibility of powder forming on the bar heaters within the combustion chamber of Kim, and therefore, provides no motivation for suggesting a means by which to remove such a powder formation. Consequently, Kim fails to suggest the desirability for including a pair of cleaning air nozzles as presently claimed. Since Hartung and Kim each fail to suggest the desirability of including such a pair of cleaning air nozzles, Hartung and Kim cannot be combined or modified to teach or suggest the aforementioned limitation of claim 9. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990); MPEP 2143.01.

Conclusion

As explained in Argument above, at least some limitations of claim 9 are not taught or suggested by the cited art. Furthermore, there is no teaching, suggestion or motivation to modify the cited art to teach the limitations of claim 9. Therefore, claim 9 is patentably distinct over the cited art. Since claims 10-13 are dependent on claim 9, claims 10-13 are patentably distinct over the cited art for at least the same reasons as claim 9. The rejection of Group III claims 9-13 under 35 U.S.C. § 103(a) is therefore asserted to be erroneous.

IX. CONCLUSION

For the foregoing reasons, it is submitted that the Examiner's rejection of claims 1-21 was erroneous, and reversal of the Examiner's decision is respectfully requested.

The Commissioner is hereby authorized to charge the required fee(s) to Conley Rose, P.C. deposit account 03-2769/5480-00201.

Respectfully submitted,

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X. APPENDIX

The present claims on appeal are as follows.

1. A gas scrubber comprising:

a combustion chamber;

a wetting chamber placed below said combustion chamber to form a single unit;

a guide plate arranged between the combustion chamber and the wetting chamber for directing a gas from the combustion chamber into the wetting chamber; and

an injection nozzle having an opening adapted to deliver a conditioned gas to a space proximate to the guide plate for minimizing the production and/or accumulation of a powder at an interface between the combustion chamber and the wetting chamber.

2. The gas scrubber according to claim 1, wherein the combustion chamber is adapted to burn flammable elements of the gas.

3. The gas scrubber according to claim 1, wherein the wetting chamber is adapted to receive water, and wherein said water reacts with water-soluble elements of the gas directed from the combustion chamber.

4. The gas scrubber according to claim 1, wherein the wetting chamber comprises:

an angled bottom surface which collects particulates produced in the wetting chamber; and

a water expulsion nozzle having an opening directed to the angled bottom surface for flushing the particulates into a drain.

5. The gas scrubber according to claim 1, wherein the wetting chamber comprises:

a plurality of water drenched absorbers across which the gas is directed; and

an exhaust pipe having an opening extending into the wetting chamber for receiving the gas after said gas is passed across at least a portion of the water drenched plurality of absorbers.

6. The gas scrubber according to claim 5, wherein the combustion chamber comprises a relatively high temperature gas, wherein the wetting chamber comprises a relatively low temperature gas, and wherein the injection nozzle is adapted to prevent the high temperature gas from coming in contact with a substantial portion of the low temperature gas.

7. A gas scrubber comprising:

a combustion chamber for eliminating explosive and flammable elements contained in a gas delivered into the combustion chamber from a gas intake;

a wetting chamber placed below said combustion chamber to receive the gas from the combustion chamber and dissolve a water soluble element of the gas; and

a means for minimizing a powder produced at an interface between said combustion chamber and said wetting chamber, wherein said means for minimizing a powder comprises a means for delivering a conditioned gas to said interface.

8. The gas scrubber according to claim 7, wherein said combustion chamber comprises:

a case connected to receive the gas intake and an air intake; and

a heating means placed inside of said case for applying heat to the gas flowing into said case from the gas intake.

9. The gas scrubber according to claim 8, wherein said heating means includes:

a heating chamber;

multiple heat exchange units arranged in a pattern of rows inside said heating chamber, wherein each of said heat exchange units comprise an electrical heating element configured inside a ceramic casing; and

a pair of cleaning air nozzles installed on an upper side of said heater chamber for periodically delivering air across the heat exchange units to minimize accumulation of powder upon an outer surface of the ceramic casings.

10. The gas scrubber according to claim 9, wherein each of the multiple heat exchange units further comprises an electrical insulator positioned between the electrical heating element and the ceramic casing in order to prevent a short circuit between the electrical heating element and the outer surface of the ceramic casing.

11. The gas scrubber according to claim 9, wherein each of the multiple heat exchange units comprises an Inconel® tube.

12. The gas scrubber according to claim 9, wherein the combustion chamber comprises a nitrogen delivery nozzle having an opening directed into the heating chamber, and wherein the nitrogen delivery nozzle directs nitrogen across an interface proximate to the multiple heat exchange units.

13. The gas scrubber according to claim 9, wherein the multiple heat exchange units comprise a first row and a second row of heat exchange units, and wherein if power to the first row of heat exchange units is terminated, power to the second row of heat exchange units is increased.

14. The gas scrubber according to claim 7, wherein a water jacket is installed on said gas intake in order to cool the gas within the combustion chamber and prevent said gas from flowing backward into the gas intake at a high temperature.

15. The gas scrubber according to claim 7, wherein said wetting chamber further includes:

a case comprising the plurality of partitions;

a plurality of absorbers installed in a region interior to the plurality of partitions, wherein said plurality of absorbers are at least partially drenched in water for dissolving water soluble elements contained in the gas as the gas flows through the plurality of absorbers;

a shower nozzle having a water delivery opening directed above each of said plurality of absorbers for drenching said plurality of absorbers; and

an exhaust pipe having an opening extending into the case for expelling a portion of said gas to an ambient outside of said case.

16. The gas scrubber according to claim 15, wherein a bottom portion of said case is configured in a v-shape to collect sludge residing in said bottom portion, wherein said sludge comprises particles entrained in water, and wherein said wetting chamber further comprises:

a drain coupled to receive said sludge from said bottom portion; and

a water nozzle coupled to a side of said bottom portion.

17. The gas scrubber according to claim 16, further comprising a sensor positioned above the drain to monitor a level of water residing in said bottom portion, wherein said sensor is configured to send a signal to initiate water flow from said water nozzle to push the sludge through the drain when said water level reaches a specified height.

18. The gas scrubber according to claim 16, wherein a pressure tube is placed in the space between said case and the drain to maintain a constant pressure within said wetting chamber.

19. The gas scrubber according to claim 16, wherein a transparent plate is hinged on one side of said case so that the water level can be checked from an exterior of the gas scrubber.

20. The gas scrubber according to claim 15, wherein an inner surface of said case and an inner surface of the exhaust pipe are coated with Teflon.

21. The gas scrubber according to claim 7, wherein said means for minimizing a powder includes:

a guide plate comprising a funnel-shaped guide configured to direct the gas from said combustion chamber to said wetting chamber; and

an injection nozzle installed on all four sides of said guide plate to inject air or nitrogen to a space proximate to the guide plate for removing the powder from the guide plate through an opening formed by the funnel-shaped guide.